SASKATCHEWAN WATER CORPORATION

*Managing a Vital Resource*

# Marketing Of Fresh Vegetables

**Irrigation Services**
**Operations Division**
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# A Guide To Marketing Of Fresh Vegetables

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# Introduction

This publication is based on a study reviewing the storage and marketing of fresh vegetables prepared for Saskatchewan Agriculture by Harvest Foods Ltd. of Saskatoon. It is intended to provide interested persons with an outline of the potential for vegetable production in Saskatchewan and some of the marketing factors that must be considered before entering into vegetable production. Production information is not included in this publication.

This publication should be used as a guide to more detailed investigation by the potential producer and should not be considered as a comprehensive document giving all there is to know about the subject. Additional information can be obtained from Saskatchewan Agriculture, Soils and Crops Branch, Regina, from established vegetable enterprises and from the industry representatives given in the appendix.

To aid you in this investigation a checklist of questions to be answered has been prepared.

# Checklist

- How much product is used in the market?
- Who are the in-season competitors?
- What is the marketing period?
- Who are the buyers in the market?
- At what level will new supply disrupt the market price?
- How much pre-storage sales can be generated?
- Where is market intelligence information available?
- Where are the prices established?
- How do prices fluctuate within the year and from year to year?
- What has been the historical average price?
- What has been the range of prices over the last three years?
- What is the current price of the product?
- What is the storage period?
- What special storage and processing equipment is needed?
- What storage conditions are needed to maintain quality product?
- What losses can be expected over the storage period?
- What size and type of packages are used in the market?
- Can the product be marketed in a bulk form?
- What is required to transport the product to market?
- Is existing transportation available?
- What specialized seeding, field equipment, harvesting and handling equipment is required?
- What specialized cultural, chemical and fertilizer practices are required?
- What is the risk of crop failure?

# Case Study

This case study describes the decision-making process to produce and market potatoes and sweet corn by a hypothetical farmer. The farm is mainly a dryland grain operation; however, it also includes 130 acres of pivot irrigation and 40 acres of flood irrigation. At present, the pivot irrigation is used to produce special crops including canola, lentils, peas and flax on a rotation basis. The flood irrigation is used to produce alfalfa. To increase the net income, the farmer decides to investigate the option of producing vegetables under irrigation.

Because the farmer has never produced vegetables, he decides to take a comprehensive look at what is involved.

### Step 1: Suitable Land

The first consideration must be the suitability of the land for vegetable production. Potatoes, for example, are most suited for sandy-loam to loam soils. The land for potatoes should be free of stones and saline areas. Sweet corn has a greater tolerance for various soil types and incidence of stones.

Along with suitable land, the irrigation equipment should be in good condition. Vegetable production requires row-cropping and potatoes require hilling operations; therefore, irrigation equipment is under more stress than under grain production. Flood irrigation can be successfully used for sweet corn production, but not for potatoes.

### Step 2: Assess Market Opportunities

The next step is to determine what vegetables offer the most opportunity in the marketplace. The trend in market demand for vegetables must be established. (See Marketing and Market Trend.) The farmer must also decide whether to market to the wholesale market or to the farmer's market or to establish a market garden. (See Marketing Alternatives.)

In this case, the farmer decides to further investigate the production of potatoes and sweet corn for the wholesale market.

### Step 3: Assess Market Conditions

The farmer determines that Saskatoon is the nearest market, but he must identify how much product is required and the price trends during the marketing season. (See Market Trend, Pricing, Table 2.)

The farmer should become acquainted with the buyers in the marketplace. The packers in the area should also be identified to assess the potential for supplying bulk deliveries. It is also important to determine who is currently supplying the market during the marketing season.

Current, as well as historical, prices and price trends during the marketing season must be identified. The buyers in the market can reasonably predict the level of new production that can be achieved without disrupting the established market price. The quantity of pre-storage sales can also be determined from the wholesalers and Agriculture Canada unload statistics.

**Step 4: Storage And Processing Requirements**

Once the level of marketing and pre-storage sales have been predicted, the size of the storage facilities can be calculated. Storage must be planned on the basis of current and future area requirements. At the same time, the storage, grading and handling equipment can be identified for current and future needs. (See Storage and Processing.)

**Step 5: Transportation**

The next consideration is the transportation of product to the market. Is there a local trucking firm which is available to haul product on a regular basis? Does the trucking firm have proper refrigeration and heating equipment to do the job properly? If there is no access to a transportation company, then the farmer must identify the size of transportation equipment necessary to accommodate the market size and yet remain economically feasible. (See Transportation.)

**Step 6: Cost Of Production**

The next consideration is the identification of costs associated with establishing the enterprise. These would include the capital cost of production equipment, storage facilities and grading and handling equipment. It would also include the operating cost for production, storage, grading, marketing and transportation. The requirement, cost and availability of labour should be identified. (See Production Costs.) Once the total of all costs are identified, a cash flow/income-expenses statement can be developed to indicate the profitability using realistic prices, yields and pack-out.

**Step 7: Financing**

If the profitability is proven to be positive, the availability of financing should be established. Financing should include long-term financing for the capital costs, short-term financing for the operating costs and allowance of further financing for expansion.

**Step 8: Risk Factor**

Because of the high capital and input cost associated with growing vegetable crops, the risk factor involved with these vegetable crops should be identified as it relates to the existing operation. The farmer must be aware of crop insurance programs or income stabilization programs that are available. In general, the high management necessary for vegetable production results in a much higher level of risk than conventional field crops.

**Step 9: Access To Information**

Because these vegetable crops are unfamiliar to the farmer he must identify what information is available from extension personnel or other producers for all phases of the operation. Because price is such an important factor in the overall profitability, access to price information must be gained.

**Step 10: Management Time**

The last consideration must be whether management is available for intensive vegetable crop production. During critical periods of the year, will management be spread too thin to successfully operate the total production unit?

## Production Decision

In this hypothetical situation, the farmer identifies a level of 40 acres of potatoes and 10 acres of sweet corn as being realistic to break into the market place. Steady growth in demand for these vegetables is a major reason for the choice of crop. The production level has been chosen so that his new production is not so large as to lower the price and therefore lower the projected revenue. This production will also accommodate a proper crop rotation using the available irrigation land base. He has determined that custom trucking is available to handle the projected quantity of vegetables. Furthermore, part-time labour is available for the critical periods of seeding and harvest. Excess labour is available throughout the marketing season.

On the other hand, the capital items do not match the level of initial production. Production equipment such as the planter, cultivator and harvestor will be under-utilized by five-fold. Grading and handling equipment will be likewise under-utilized. The storage facility cost, including the ventilation, temperature control and humidification equipment will be considerably cheaper on a square foot basis if the building can be extended to accommodate twice the anticipated volume.

The farmer is faced with several choices. The first is to operate with a new equipment inventory that will be drastically under-utilized. This will have a negative effect on the cash flow and increase the risk of the operation. The other choice is to invest in used equipment that would reflect the level of production. In the case of the storage facilities, the alternatives are to face higher capital costs in the future or under-utilize the space available.

In this case, the farmer decides to double the capacity of the storage and utilize the excess space for grading and packaging. If expansion of the operation can occur, the total area can be used for storage and a less expensive work area can be added. He also decides to buy used equipment which is available and more closely matches the production level. He decides to market the potatoes in bulk to a packer so that he minimizes the initial investment in packaging equipment.

Using this plan, the farmer is able to project a profitable income/expense statement and, therefore, able to acquire the necessary financing.

The farmer realizes that the vegetable operation contains a high level of risk combined with more timely management. Nevertheless, the beginning production level is within his financial means and he decides it is worth the opportunity for higher returns.

# Marketing

Intelligent marketing requires an understanding of the marketplace and all the variables which make the marketplace dynamic. It is necessary to be able to identify the size of the market for a particular product. The competitors in the market must be identified, particularly those who are in direct competition during the anticipated marketing season.

The actual marketing process for vegetables in Saskatchewan involves a number of marketing functions. Before a product ends up with the consumer, it may have travelled through several hands. Wholesalers are established in all the major centres in Saskatchewan. There are also major packers in both Regina and Saskatoon and a number of grower-packers with varying capabilities to package throughout the province. The majority of the potatoes and onions in the province are sold in a bulk form to packers who then re-package the product for the wholesale trade. Carrots are packaged by the grower and normally sold directly to the wholesaler. Both rutabagas and cabbage are sold in bulk units (i.e. 50 lb bags or boxes) and normally go directly from the grower to wholesaler. Sweet corn is normally sold directly to the wholesaler by the grower and in some cases, with smaller growers, may be sold directly to retailers.

## Know The Market

Market development must begin with knowledge of the buyers in the marketplace. Beyond the Federal Government requirements for quality and packaging, a grower must identify the industry standards for the product as it presently exists in the marketplace. In order to penetrate a market a new supplier must be able to match or exceed the quality of the product presently supplied.

## Buyers' Requirements

Packers and wholesalers must maintain strict guidelines for products they purchase. Their most important requirements are for a consistent supply and a reliable supplier. It is necessary that the supply of product is of the highest quality available and remains that way during both light and heavy demand. With a consistent supply of quality product, packers and wholesalers give preference to local suppliers.

## Marketing Alternatives

A prospective vegetable producer has several options available when deciding how to market his or her product.

1. Direct farmgate sales.
2. Road side stand.
3. Peddle door to door.
4. Farmer's market.
5. Wholesale to retail outlets.
6. Bulk sale to broker.
7. Package sale to wholesaler or broker.

Options one to five are usually best suited to the small acreage and the inexperienced growers. Options six and seven are most suited to larger commercial operations, and are the basis for most of this publication.

Each option has some advantages and disadvantages. Some of these are outlined below.

### Direct Farmgate Sales

This option eliminates the middleman thus increasing the return to the grower, and is the least expensive marketing method. At a start-up level of production a grower does some initial advertising, then waits for customers to arrive at the farm. Produce may be sold as a 'U-Pick' operation or in a harvested state. In many cases the vegetables will be harvested while the customer waits.

This method fosters a close relationship between grower and customer and can be a very satisfying method of selling.

As the size of the operation increases, additional facilities such as a sales building, display coolers and refrigerated walk-in storage may be required. At this level of production the crop is harvested and put into temporary storage at the sales station in such a manner that there is sufficient produce on hand to meet current sales but very little left at day's end.

The disadvantages of farmgate sales include the necessity of having an easily accessible location, preferably on a main traffic artery, and the loss of privacy in your farm yard.

### Road Side Stand

Since most growers will not be located on a main highway the road side stand is a means to access to the market without moving the whole farm. This is a popular method in many parts of North America but is seldom seen in Saskatchewan. It's main advantages are a large potential volume of sales and increased per unit income through selling direct to the customer.

Road side stands work best when on a major tourist traffic highway or near a recreation area.

They require a higher labor input than farm gate sales, as the grower must have an employee or family member at the stand even during periods of low sales, and the produce must be transported to the stand from the farm.

### Door To Door Sales

This is not a common method but it does increase the size of the potential market. The major disadvantages of door to door sales are the high cost for labor and transportation.

### Farmer's Market

Farmer's markets have become one of the major sales outlets for small scale vegetable producers. A well run farmer's market provides a relatively low cost access to a large market. The grower benefits from group advertising and organization, thus reducing cost, time and effort necessary to market the produce.

Disadvantages would include a more structured marketing situation, i.e. specific times and rules are enforced, and greater direct competition from other producers.

**Wholesale To Retail Outlets**

Restaurants and food stores would be the major outlets. Advantages are larger volume to a single buyer. Disadvantages are lower per unit price than direct sales, higher quality standards, therefore more wasted produce, product must be graded, and the difficulty in convincing individual retail managers to purchase from you. This procedure is usually only successful in small urban centers.

**Bulk Sales To Brokers**

The major advantage with this method is the much larger volume of produce the grower is able to sell to one buyer, thus increasing efficiency. The grower may also be able to specialize in fewer crops than in a market garden situation.

Disadvantages compared to previous choices are lower per unit selling price, all produce must be washed and graded, and the grower must maintain high quality standards and continuity of supply over a given time period. This generally means a large capital expense on storage and handling facilities.

**Packaged Sales To Wholesalers**

This method is the most comprehensive of the options available to growers. The producer washes, grades, and packages the produce into the packages that are sold to the consumer from the store shelf.

The advantages of this method over bulk sales to brokers are: the producer has more control over how the product is presented to the consumer, he is able to advertise his product and farm directly to the consumer and by adding one more step in the processing of the product the grower stands to gain that additional income.

The main disadvantage is the greater capital cost and labor expense involved in packaging the product in small units. The operation must be either very large or diversified in order to make efficient use of equipment and hired labor. Running a packaging line one day a week is poor economics.

## Market Trend

The wholesale market size for fresh vegetables is recorded in Agriculture Canada's publication, **Annual Unload Report Fresh Fruits and Vegetables on 12 Canadian Markets**. This publication reports the quantity of product, sources of supply by province and state for many fruit and vegetable products.

Table 1 shows the quantity of six vegetables on Regina and Saskatoon markets for 1980 to 1985. Potatoes, sweet corn and carrots have experienced substantial growth rates. Conclusions about market trends should always be confirmed by the wholesale buyers, since increases in reported unloads may reflect a change in distribution or reporting methods, rather than a change in market demand.

The source of imported and domestic supply and growth in the market for potatoes, cabbage, rutabaga, onions, sweet corn and carrots is shown in Table 2.

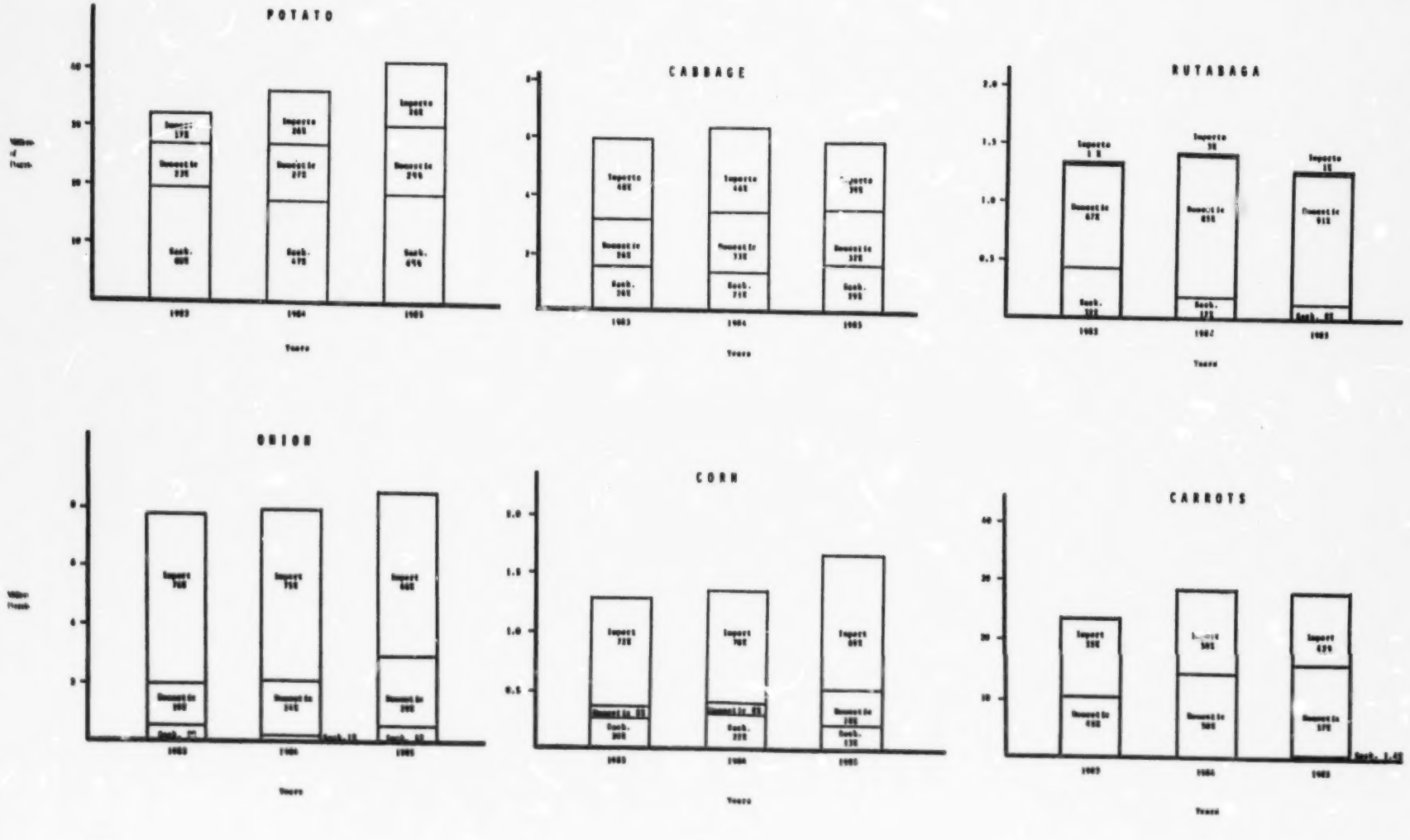
**Table 1:** Wholesale Market for Six Selected Vegetables in Regina and Saskatoon (000 lbs)*

| | 1980 | 1981 | 1982 | 1983 | 1984 | 1985 | 6-Year Av. Ann. Growth |
|---|---|---|---|---|---|---|---|
| Potatoes | 29,019 | 26,570 | 32,474 | 32,096 | 36,216 | 41,748 | 7.5% |
| Cabbage | 5,918 | 5,657 | 5,522 | 5,878 | 6,216 | 5,843 | decline |
| Rutabaga | 1,267 | 1,279 | 1,221 | 1,296 | 1,359 | 1,242 | No change |
| Onions | 7,706 | 8,352 | 8,429 | 7,770 | 7,813 | 8,406 | 1.75% |
| Corn | 828 | 875 | 1,175 | 1,265 | 1,355 | 1,698 | 15.5% |
| Carrots | 4,427 | 4,615 | 4,530 | 4,674 | 5,624 | 5,610 | 4.5% |

## Comparative Advantage

Fresh vegetables can be marketed readily across provincial boundaries; therefore, Saskatchewan vegetable growers must compete with vegetables supplied from areas such as Manitoba and Alberta. Vegetable growers in the province have one comparative advantage which is a higher market price for vegetables.

**Table 2:** Market Trends



### Transportation Costs

Vegetable growers establish the price of vegetables based on the Manitoba or Alberta price plus the cost of transportation to Saskatchewan. Therefore, prices in Saskatchewan are higher than in Manitoba or Alberta, and this provides a comparative advantage to vegetable production in this province. It can also be suggested that the preference for locally-grown production by packers, wholesalers and consumers is a further comparative advantage.

Saskatchewan's advantage is partially off-set by natural and artificial advantages in Manitoba. Examples of these include:

#### Marketing Advantage

a. Manitoba growers subsidize the cost of freight to Saskatchewan to minimize Saskatchewan's comparative advantage. Manitoba growers take part of the revenue from sales earned in Manitoba and subsidize freight costs to Saskatchewan. This creates a larger market and enables them to achieve higher economies of scale.

b. Manitoba has a single-desk selling agency for all fresh vegetables. This provides convenience to wholesalers, since one telephone call can arrange an order for several vegetables.

c. Since Manitoba can provide several products on one load, it can deliver mixed loads of vegetables. Small quantities of sweet corn, cauliflower, etc., can be delivered to Saskatchewan in these mixed loads at economical shipping rates.

#### Production Advantages

The vegetable producing areas of Manitoba and southern Alberta receive a greater amount of heat than Saskatchewan. In certain years this can provide an advantage in maturing the crop before a frost. This earlier maturity date allows Manitoba, and occasionally Alberta, to enter the market before Saskatchewan's vegetables are available.

## Pricing

### Open Market

The vegetable market in Saskatchewan is an open market governed by the forces of supply and demand. In general, market prices are established by large producing areas in the USA and reflect on the Saskatchewan market through our neighboring provinces of Manitoba and Alberta. Certain products are less sensitive to outside influence, especially at different periods through the marketing season; therefore, prices may be established by in-province competition. Potato prices in Saskatchewan, for example, are normally established by prices in Manitoba and Alberta throughout the marketing year. Sweet corn prices, on the other hand, are initially established in the same manner; however, in September, prices are often established by supply within the province.

### Full Market

It must be recognized that the available market in Saskatchewan is now being satisfied by either in-province or out-of-province suppliers. Introduction of a new, large supply of product into the market may have detrimental effects on price as existing suppliers attempt to maintain their market share. Gradual increases of new supplies tend not to disturb the price, especially if demand is growing.

### Knowledge Of Price

It is necessary to have an adequate knowledge of the market price for a product and how the price is established. Increasing the price for vegetables will reduce sales. Most products have a general price trend that is predictably related to supply and demand. Often, decisions have to be made on whether to market during periods of higher supplies and lower prices, or accept the added costs and risks of retaining product for a later time when the market will have lower supplies and higher prices. The unit prices of produce sold direct to the consumer will often be more than twice the wholesale or brokerage price but marketing costs will be lower and volume higher with the latter method.

## Storage And Processing

Successful storage of vegetables is dependent upon two factors:

1) the condition of the product going into storage; and

2) the ability of the storage to maintain an artificial environment that optimizes the quality and extends the storage period. Product going into storage must be free of excessive damage and disease, and must be mature.

The main factors involved in creating an artificial environment are temperature, humidity and ventilation. All vegetables require control of these three factors in storage.

With most vegetables, a combination of high humidity and low temperatures necessitates a well-constructed building with above-normal insulation. Bulk piling of vegetables necessitates a design capable of handling the pressure of the pile. Interior building materials that lend themselves to proper sanitation on a year-to-year basis should be used. The layout of the building must be designed to use the storage space most efficiently and, at the same time, allow for efficient movement of product in and out of storage.

All vegetables held in storage are susceptible to weight loss due to shrink. Losses due to disease tend to be directly proportional to the length of time in storage. Other quality losses, such as color, taste and appearance may be particular to a certain vegetable, but are also directly proportional to the storage period.

Several vegetables, such as carrots, cabbage and rutabagas, can be stored under the same basic environmental conditions. Storage bins, primarily designed for one vegetable such as potatoes, can be easily adapted for other vegetables such as rutabagas. Other vegetables, such as onions, if held in the same storage,

must be completely isolated because of the vast differences in the humidity requirements.

### Refrigeration

Optimum conditions for certain vegetables, such as carrots, cannot be achieved without the use of refrigeration. Standard refrigeration is not always serviceable in very low temperatures and very high humidities. Adaptation of standard refrigeration or use of sophisticated refrigeration such as Filacell refrigeration is necessary to achieve optimum conditions. Storage, which provides less than optimum conditions will accelerate losses due to shrink and disease, and will shorten the period that vegetables can be kept in storage.

Use of pallet bins within storage can allow for the accommodation of several vegetable within one building, as long as they are compatable in terms of temperature and humidity. This is particularly beneficial in a small, diversified operation. The benefits must be weighed against the high capital and maintenance cost of the bins and the loss in storage capacity for a particular size of building. There is a loss in storage capacity in bins over bulk piling.

### Packaging And Processing Equipment

Beyond the Federal Government requirements for grades and sizes of packages, most markets have traditionally-sized products which account for the majority of sales. Packaging and processing equipment must be matched to size of the operation and the type of packing necessary to market the product. Equipment should be purchased with a view to future expansion or diversification. For certain products, such as potatoes and onions, bulk sales to a packer are possible. Some products require further conditioning such as hydro-cooling of sweet corn, or waxing of rutabagas.

### Labour

The cost of labour during the storage and processing period is directly related to the size of operation, the degree of capitalization, the package sizes to be sold and the degree of further conditioning required to prepare the product for the market. It is often advantageous for a new producer to market product in bulk quantities to a packer and/or wholesaler to minimize both capital and labour costs until the operation is fully established.

### Pack-Out

Pack-out is a term used to describe the quantity of product actually sold out of storage as compared to the gross quantity put into storage or harvested directly out of the field. The difference amounts to losses due to shrinkage, cullage due to damage and disease, and deterioration in quality factors such as color and appearance. In the marketing component of an operation, pack-out is one of the main factors in determining the viability of an operation. Assuming consistent prices, for every one percent drop in pack-out there is a corresponding one percent drop in gross revenue per acre. As pack-out decreases over the storage period, prices must rise to keep gross income stable.

## Transportation

Natural transportation flows can affect both the price and availability of product in a particular marketplace. Markets located on main truck routes, such as Regina and Saskatoon, tend to be more accessible to outside suppliers in Manitoba and Alberta. At the same time, freight rates along these routes are cheaper due to the supply of trucks. Large trucking firms in need of back-hauls (see Definitions) into a market area can affect the competitive price of product. For example, if the competition has access to a back-haul into the market area, then they will experience a lower cost of transportation. Local trucking firms in need of back-hauls from rural points into a market area can be a real advantage to local suppliers.

The capital and maintenance cost of owned transportation is a significant contributor to overall cost. Equipment must match the anticipated marketings and, at the samer time, be of a size that is economically feasible.

Shipping during the early season, or shipping products such as sweet corn, may require specialized equipment such as refrigerated vans. Shipping during the winter months will require well-insulated vans with extra heating equipment.

In market areas like Saskatchewan, where self-sufficiency for most vegetables has not been achieved, transportation costs from other producing areas will increase the market price by the amount of the cost. However, these prices will be tempered by the availability of cheaper back-hauls, or the freight subsidy instituted by other producing areas, such as Manitoba.

## Marketing Factors

Each vegetable crop has specific requirements for production, marketing, and storage. Production details are available in the Vegetable Production Guide. The major marketing and storage factors for the six selected vegetables are given in Table 3. Storage requirements and building design should be investigated in detail by the grower prior to any construction.

It should be noted that the marketing and storage periods, and the shrinkage and pack-out percentages are for produce that is of top quality when put into storage and for storages managed to maintain that quality. Insects, disease or mechanical damage, excessive foreign material in the storage bin, or poor management in temperature and humidity control will reduce the storage life and quality of any vegetable below the guidelines given in Table 3.

**Summary Matrix of Storage and Marketing Factors**

| Factor | Potatoes | Onions | Carrots | Cabbage | Rutabagas | Corn |
|---|---|---|---|---|---|---|
| Apparent consumption | 33,093,000 lbs. | 7,867,000 lbs. | 4,943,999 lbs. | 5,807,000 lbs. | 1,303,000 lbs. | 1,212,000 lbs. |
| Sask. Wholesale Mkt. Share | 48% | 2% | 1% | 24% | 26% | 85% (in season) |
| Marketing period | Year round | Sept. 1 to Mar. 31 | Aug. 1 to Jan. 31 | July 1 to Jan. 31 | Aug. 1 to May 31 | Aug. 1 to Sept. 30 |
| Average price (see def.) | 12.2¢/lb. | 13.0¢/lb. | 17.0¢/lb. | 14.4¢/lb. | 16.2¢/lb. | 1.54/Doz. |
| Price range | 7.7-21.0¢/lb. | 9.5-29.2¢/lb. | 14.0-22.8¢/lb. | 10.0-18.0¢/lb. | 14.9-19.5¢/lb. | $1.30-$1.60/doz. |
| Sept. 1 Storage period | Oct. 1 to July 31 | Oct. 1 to Mar. 31 | Oct. 1 to Jan. 31 | Oct. 1 to Jan. 31 | to May 31 | NIL |
| Harvest period | Aug. 1 to Sept. 30 | Sept. 1 to Sept. 30 | Aug. 1 to Sept. 30 | July 1 to Sept. 30 | Aug. 1 to Sept. 30 | Aug. 1 to Sept. 30 |
| Temperature & R.H. | 3 - 5° C & 95% R.H. | 1 - 4° C & 65 - 70% R.H. | 0 - 1° C & 95+% R.H. | 0 - 1° C & 95+% R.H. | 0 - 1° C & 95+% R.H. | N/A N/A |
| Shrink at end of storage period | 14% | 12% | 5% | 10% | 10% | N/A |
| Pack-out at end of storage period | 80% | 80% | 75 - 80% | 75 - 80% | 60 - 70% | N/A |
| Package sizes | 50#, 75#, 100# Jute 50# box 5, 10, 10# plastic | 50#, 25# mesh 3#, 10# net | 50# plastic 2, 3, 5# plastic | 50# mesh | 50# mesh 50# box wash or waxed | 5 doz. per bag |
| Transportation conditions | 4° C | 4° C Low R.H. | 1 - 2° C High R.H. | 1 - 2° C High R.H. | 1 - 2° C High R.H. | 0 - 1° C High R.H. |

1 lb. = 0.4536 kg.; 2.2 lbs. = 1 kg.

## Estimated Marketable Yield

Successful marketing of fresh vegetables to the wholesale market requires the ability to store quality products. The artificial environment provided by storage facilities, however, is not a perfect environment and some deterioration of vegetables is inevitable. The degree of deterioration will depend on:

1. Condition of product put into storage (includes mechanical damage during harvesting and handling, as well as frost);

2. Type of storage facilities;

3. Temperature, humidity and ventilation conditions during storage; and

4. Length of storage time.

As product is removed from storage, it must be graded to remove vegetables that are not acceptable in the marketplace. The saleable product or 'pack-out' is the marketable yield per acre. Table 3 describes the estimated marketable yield for six selected vegetables. It should be recognized that marketable yield can be highly variable and complete crop losses can be experienced in some years. Revenue projections should always be based on the marketable yield achieved by a grower based on specific storage facilities, storage period and management skills.

## Relationship Of Production And Marketing Costs

Cost of production, storage and marketing can vary greatly between vegetable operations. Several factors will influence the costs, such as level of capitalization, geographic location, economies of scale and management skills. Nevertheless, some estimated costs are presented to serve as a guide to potential vegetable growers.

Table 4 presents the estimated annual cost of storing and marketing potatoes. These costs assume a farm located 120 kilometers from Saskatoon. The storage capacity is 2000 tons. The building has a cement floor and necessary equipment for control of temperature, humidity and ventilation. The replacement cost of the facility, including unloading equipment, is estimated at $11.75 per ton. The cull and shrink loss assumes slightly below average costs due to experienced management and good storage facilities. Price of potatoes is $200.00 per ton. The total operating cost for storage and marketing is estimated at $94.00 per ton. Table 5 presents these costs in percentage terms.

The relationship between cost of production, storage and marketing is shown in Table 6, using potatoes as an example. In the section on Potatoes, the cost of producing potatoes is estimated to be $75.00 per ton; therefore, storage and marketing costs are estimated to exceed the cost of production. Table 7 describes the relationship for each cost component which makes up the production, storage and marketing of potatoes.

**Table 3:** Marketable Yield of Selected Vegetables

| Vegetable | Est. Harvest Yield (tonnes/acre) | Average * Loss In Storage | Estimated Marketable Yield (tonnes/acre) |
|---|---|---|---|
| Potatoes | 10.8 | 20% | 8.6 |
| Cabbage | 12.0 | 25% | 9.0 |
| Rutabaga | 15.0 | 33% | 10.0 |
| Onion | 10.0 | 20% | 8.0 |
| Sweet Corn | 1200 doz. | -- | 1100 doz. |
| Carrots | 18.0 | 25% | 13.5 |

* Assumes storage conditions and period described in Summary Matrix.

# Estimated Cash Production Costs and Yield

## Potatoes

**Seeding**
55 gm (2 oz.) seed pieces at 90 cm x 30 cm (36 in x 12 in) spacing 2040 kg/ha (1820 lb/ac)

**Seed Treatment**
All cut seed should be treated with a fungicide powder to control seed piece decay and surface infection.

**Fertilizer** kg/ha (lbs/ac)
N - 170 (150) range 100 - 200
P - 85 (75) range 40 - 100
K - 65 (58) range 0 - 100

**Herbicides**
Pre-plant incorporated and pre-emergent and post-emergent (inter-row cultivation may eliminate one of the above).

**Insecticide**
Treat for wireworm following grass or cereal and treat for potato beetle or other insects as needed.

**Fungicides**
Treatment for blight may be necessary, 3 applications 10 days apart beginning first week of July.

**Top Killing**
Top kill 10 to 20 days prior to harvest.

**Storage Disease Control & Sprout Control**
For long term storage many growers will treat the tubers for storage disease and sprout inhibition.

| Budget | $/Ha | $/Ac |
|---|---|---|
| Seed | 494 | 201 |
| Seed Treatment | 33 | 13 |
| Fertilizer N | 104 | 42 |
| P | 64 | 26 |
| K | 15 | 6 |
| Herbicides | 96 | 39 |
| Insecticide | 80 | 32 |
| Fungicide | 67 | 27 |
| Top Killing | 37 | 15 |
| Storage Disease Control | 100 | 40 |
| Sprout Inhibition | 57 | 23 |
| Irrigation: Fuel | 84 | 34 |
| Repair | 15 | 6 |
| Equipment Fuel | 37 | 15 |
| Repair | 74 | 30 |
| Hired Labor | 170 | 69 |
| Land Taxes | 10 | 4 |
| Overhead | 49 | 20 |
| Operat. Interest | 166 | 67 |
| Total Cash Cost To Storage | 1752 | 709 |

| | Poor | Ave | Good |
|---|---|---|---|
| Field Yield (tonne/ac) | 8 | 11 | 15 |
| Marketable Yield | 6 | 9 | 13 |

**Moisture Use**
500 to 600 mm (18 - 20 in). Stress early in the season will result in lower tuber numbers, stress in August and September will reduce tuber size.

## Cabbage

**Seeding**
May be direct seeded or transplanted. Transplants increase cost by $500.00 per acre.
Spacing: 75 cm x 30 cm early, 75 cm x 40 cm late. Rate: 1 kg/ha (.5 to 2). Seed cost will vary widely between varieties.

**Seed Treatment**
Hot water treated and fungicide treated.

**Fertilizer** kg/ha (lbs/ac)
N - 120 (110) range 90 - 150
P - 100 (90) range 75 - 110
K - (sandy soils only) 150 (134) range 130 - 170
Summer cabbage reduce N 30%

**Weed Control**
Pre-plant incorporation of trifluralin, inter-row tillage no chemical control of winter annual available. If hand weeding is necessary double labor cost shown.

**Insect Control**

Will be required for flea beetle and cabbageworm and occasionaly other pests. Many insecticides available. Application on weekly basis may be necessary.

| Budget | $/Ha | $/Ac |
|---|---|---|
| Seed | 120 | 48 |
| Seed Treatment | 3 | 1 |
| Fertilizer N | 76 | 31 |
| P | 79 | 32 |
| Herbicides | 30 | 12 |
| Insecticide (3 appl) | 60 | 24 |
| Irrigation. Fuel | 80 | 32 |
| Repair | 15 | 6 |
| Equipment. Fuel | 37 | 15 |
| Repair | 62 | 25 |
| Hired Labor | 495 | 200 |
| Land Taxes | 10 | 4 |
| Overhead | 50 | 20 |
| Operat. Interest | 117 | 47 |
| Total Cash Cost to Storage | 1234 | 497 |

| | Poor | Ave | Good |
|---|---|---|---|
| Field Yield (tonne/acre) | 8 | 12 | 18 |
| Marketable Yield | 3 | 9 | 14 |

**Rotation**
Cabbage should not be planted on land which has grown cole crops or rutabagas in the past three (3) years.

**Moisture Use**
Cabbage is shallow rooted. 45 to 60 cm (18 - 24 inch) critical stress period is head development and expansion. Uneven moisture conditions can result in splitting. Water use 359 mm (14 inch) for summer cabbage and 450 mm (18 inch) for winter cabbage.

**See Vegetable Production guide for Details on Production**

## Rutabaga

**Seeding**
Row spacing 60 or 75 cm (24 or 30 in) within row. 10 cm (4 in) seeding rate .5 - 1 kg/ha (.5 - 1 lb/ac)

**Seed Treatment**
Use hot water treated seed and a fungicide

**Fertilizer** kg/ha (lbs/ac)
N - 50 (45) range 40 - 70
P - 100 (90) range 80 - 120

**Weed Control**
Pre-plant incorporate EPTC or Trifluralin.

**Insect Control**
Flea Beetle and root maggot control with either a granular insecticide in the row at seeding time or a liquid drench after emergence.

**Disease Control**
A long rotation 5 to 7 years within dissimilar crops is necessary to reduce disease pressure.

| Budget | | $/Ha | $/Ac |
|---|---|---|---|
| Seed | | 15 | 6 |
| Seed Treatment | | 3 | 1 |
| Fertilizer N | | 32 | 13 |
| P | | 80 | 32 |
| Herbicides | | 30 | 12 |
| Insecticide | | 30 | 12 |
| Irrigation: Fuel | | 80 | 32 |
| Repair | | 15 | 6 |
| Equipment: Fuel | | 37 | 15 |
| Repair | | 74 | 30 |
| Hired Labour | | 300 | 120 |
| Land Taxes | | 10 | 4 |
| Overhead | | 50 | 20 |
| Operat. Interest | | 80 | 32 |
| Total | | 836 | 335 |
| | Poor | Ave | Good |
| Field Yield (tonne/ac) | 10 | 15 | 20 |
| Marketable Yield | 5 | 10 | 16 |

**Moisture Use**
Rutabaga have a root zone of 90 to 120 cm (3 to 4 feet). They are even less sensitive than many other vegetables to moisture stress, but an even moisture supply will result in highest yields and prevent woodiness and reduce growth cracks. Total water use will be 350 to 400 mm (14 to 16 inches).

**See Vegetable Production Guide for details on Production.**

## Onion

**Seeding**
2 - 4 kg/ha (lb/ac) row spacing
60 cm (24 in) for single rows or 20 cm ( 8 in) on multi-row beds. Seed as early as possible.

**Seed Treatment**
Seed may be purchased pre-treated, if not, treat with an approved fungicide. Cost will vary according to disease to be controlled.

**Fertilizer** kg/ha (lbs/ac)
N - 75 (65) range 50 - 85
P - 110 (95) range 80 - 130
K - (sandy soils only) 150 (134) range 130 - 170

**Weed Control**
Onions are not competitive and require excellent weed control for good results. Several herbicides are available.

**Insect Control**
Root maggots are the major insect pest. They can be controlled with a seed placed granular insecticide, a liquid drench at the two leaf stage or multiple broadcast sprays.

| Budget | | $/Ha | $/Ac |
|---|---|---|---|
| Seed | | 351 | 142 |
| Seed Treatment | | 3 | 1 |
| Fertilizer N | | 45 | 18 |
| P | | 80 | 32 |
| K | | 25 | 10 |
| Herbicides | | 125 | 50 |
| Insecticides | | 45 | 18 |
| Irrigation: Fuel | | 60 | 24 |
| Repair | | 15 | 6 |
| Equipment: Fuel | | 37 | 15 |
| Repair | | 74 | 30 |
| Hired Labor | | 170 | 69 |
| Land Taxes | | 10 | 4 |
| Overhead | | 49 | 20 |
| Operat. Interest | | 126 | 51 |
| Drying | | 1235 | 500 |
| Total Cash Cost to Storage | | 2450 | 990 |
| | Poor | Ave | Good |
| Field Yield (tonne/ac) | 8 | 10 | 16 |
| Marketable Yield | 4 | 8 | 14 |

**Moisture Use**
Onions require frequent light irrigation until after emergency. Maximum water use is during bulb enlargement, mid July to mid August. Irrigation should be witheld after mid August to promote maturation. Onions are shallow rooted 45 to 60 cm (18 - 24 inches). Total water use 300 to 350 mm (12 - 14 inches).

**See Vegetable Production Guide for details on Production**

## Sweet Corn

**Seeding**
Row spacing 75 cm (30 in) or 90 cm (36 in). 50,000 plants per hectare (20,000/acre)
10 kg/ha (9 lbs/ac) actual rate will vary by seed size.

**Seed Treatment**
When planting in a cool soil treat seed with a fungicide. A dual purpose treatment should be used if wireworms are a potent problem.

**Fertilizer** kg/hz (lbs/ac)
N - 160 (140) range 100 - 180
P - 70 (60) range 30 - 100

**Weed control**
A combination of pre-plant incorporated, pre-emergent, post-emergent chemical and inter-row cultivation is available.

**Handling**
Sweet corn loses quality very rapidly after harvest. Keep cook and market as soon as possible.

| Budget | | $/Ha | $/Ac |
|---|---|---|---|
| Seed | | 100 | 41 |
| Seed Treatment | | 3 | 1 |
| Fertilizer N | | 96 | 39 |
| P | | 52 | 21 |
| Herbicides | | 50 | 20 |
| Irrigation: Fuel | | 89 | 36 |
| Repair | | 30 | 12 |
| Equipment: Fuel | | 15 | 6 |
| Repair | | 32 | 13 |
| Hired Labor | | 500 | 200 |
| Land Taxes | | 10 | 4 |
| Overhead | | 50 | 20 |
| Operat. Interest | | 108 | 43 |
| Total | | 1135 | 462 |
| | Poor | Ave | Good |
| Field Yield (in doz) | 800 | 1200 | 1500 |
| Marketable Yield | 600 | 1100 | 1500 |

**Moisture Use**
400 - 500 mm/year (16-20 in). Critical stress period one week prior to silking to harvest.

**See Vegetable Production Guide for details on Production**

## Carrots

**Seedbed Preparation**
Carrots require a loose friable soil to produce a high yield of long straight roots. Generally this means tillage to 30 cm or raised beds.

**Seeds**
For mechanical harvesting seed in rows 60 cm (2 ft) apart at a rate of 3-4 kg/ha (34 lbs/ac). Final stand should be 100 plants/meter. Coated seed is available at extra cost. Seed cost ranges from $30/kg to $175/kg.

**Fertilizer** kg/ha (lbs/ac)
N - 70 (60) range 60 - 90
P - 50 (45) range 40 - 60

**Weed Control**
Pre-plant incorporated, pre-emergent and post-emergent sprays are available. Incorporation should be after the deep tillage operation.

| Budget | | $/Ha | $/Ac |
|---|---|---|---|
| Seed | | 254 | 105 |
| Fertilizer N | | 42 | 17 |
| P | | 40 | 16 |
| Herbicide | | 50 | 20 |
| Irrigation: Fuel | | 80 | 32 |
| Repair | | 15 | 6 |
| Equipment: Fuel | | 37 | 15 |
| Repair | | 74 | 30 |
| Hired Labor | | 250 | 100 |
| Land Taxes | | 10 | 4 |
| Overhead | | 50 | 20 |
| Operat. Interest | | 94 | 38 |
| Total | | 996 | 403 |
| | Poor | Ave | Good |
| Field Yield (tonne/ac) | 10 | 18 | 21 |
| Marketable Yield | 4 | 18 | 16 |

**Moisture Use**
Irrigation required frequently to promote even germination and emergence. Sensitive to moisture stress during root enlargement (August). Ensure moisture penetration to at lease the depth of the main root when irrigating. Water use 400 mm (16 in).

**Table 4:** Estimated Storage and Marketing Cost Breakdownn for Potatoes - 1986

| | Per Marketed Ton |
|---|---|
| Capital Investment Cost | $15.00 |
| Operating Cost (Utilities, Interest, etc.) | 23.00 |
| Cull Loss (12.5%) | 25.00 |
| Shrink (4.5%) | 9.00 |
| Cost of Washing Equipment | 4.40 |
| Cost of Packaging Equipment | 1.00 |
| Labor | 8.80 |
| Transportation $0.75/cwt | 16.50 |
| Selling and Marketing Intelligence | 1.00 |
| Estimated Total | $103.70 |

**Table 5:** Estimated Storage and Marketing Cost Components For Potatoes

| | | |
|---|---|---|
| **Storage** | | |
| Investment Cost | 14.0% | |
| Operating Cost | 22.0% | |
| Cull Loss | 24.0% | |
| Shrink | 9.0% | |
| Washing and Grading | 14.0% | |
| | | 83.0% |
| **Marketing** | | |
| Transportation | 16.0% | |
| Selling and Marketing | 1.0% | |
| | | 17.0% |
| | | 100.0% |

**Table 6:** Estimated Cost of Production Storage And Marketing For Potatoes

| | Cost Per Marketed Tonne | % of Total Cost |
|---|---|---|
| Production | $75.00 | 42% |
| Storage and Marketing | | |
| Storage | 86 | 58% |
| Marketing | 18 | |
| | $179/tonne | |

**Table 7:** Production, Storage and Marketing Cost Components for Potatoes

| | |
|---|---|
| Production, Storage and Market Costs | 100.0% |
| **Marketing** (10%) | |
| 1. Transportation | 9.0 |
| 2. Selling and Marketing | 1.0 |
| **Storage** (48%) | |
| 1. Investment Cost | 8.0 |
| 2. Operating | 13.0 |
| 3. Cull Loss | 14.0 |
| 4. Shrink | 5.0 |
| 5. Washing and Grading | 8.0 |
| **Production** (42%) | |
| 1. Crop Input | |
| - Seed | 9.0 |
| - Fertilizer | 3.0 |
| - Chemicals | 5.0 |
| 2. Cash Costs | |
| - Potato Equipment & Maintenance | 3.0 |
| - Irrigation Equip. & Maintenance | 1.5 |
| - Interest | 2.0 |
| - Other | 3.0 |
| 3. Labor | 3.5 |
| 4. Capital Cost Allowance | 12.0 |

## Definitions

Apparent Consumption:
Product used in the Regina and Saskatoon markets according to Agriculture Canada unload data.

Marketing Period:
The length of time that product is available out of the field until the end of the storage season.

Average Price:
Average price F.O.B. the Regina and Saskatoon markets for the period July 1, 1982 - June 30, 1985, calculated from Manitoba and Alberta price lists less freight equalization plus freight and/or prices established by the S.V.M.C. for the period.

Price Upcharge:
Increase in price charged for a product to cover costs of extra labor and material.

Storage Period:
Length of time product can be held in storage with proper conditions and equipment.

Shrinkage:
Natural loss in weight due to water loss in the product.

Pack-out:
Term expressed in percentages to identify the net product shipped to market as opposed to the gross product harvested.

Back Haul:
Term used in the transportation industry to identify return trip from a primary haul. Back hauls normally generate considerably less income than the primary haul.

## Industry Contacts

### Wholesale Buyers

Codville Company
Box 750
2820 Jasper Avenue
Saskatoon, Saskatchewan
S7K 3L9

Scott National Co. Ltd.
Box 508
Saskatoon, Saskatchewan
S7K 3L6

MacDonalds Consolidated Ltd.
2510 Jasper Avenue
Saskatoon, Saskatchewan
S7K 2K2

Saskatoon Fresh Pack
1526 - 16th Street West
Saskatoon, Saskatchewan
S7M 1G1

Martins Vegetables Sales
Box 1906
Saskatoon, Saskatchewan
S7K 3L6

Western Grocers
1700 Park Street
Box 1310
Regina, Saskatchewan
S4P 3C1

Scott National Co. Ltd.
266 Dewdney Avenue
Regina, Saskatchewan
S4P 2Z4

MacDonald Consolidated Ltd.
1400 Park Street
Regina, Saskatchewan
S4P 2Z4

Cole Potato Company
1230 St. John St.
Regina, Saskatchewan
S4R 1R9

### Packaging

Crown Forrest Industries Ltd.
#43 - 1736 Quebec Avenue
Saskatoon, Saskatchewan
S7K 1V9

Bonar Packaging
203 - 135 Robin Crescent
Saskatoon, Saskatchewan
S7L 6M3

MacMillan Bathurst Inc.
Box 1340
Saskatoon, Saskatchewan
S7K 3N9

Great Plains Packaging Equipment Ltd.
126 - 6th Avenue East
Regina, Saskatchewan
S4N 5A5

MacMillan Bathurst Inc.
1400 - 1st Avenue
Regina, Saskatchewan
S4N 4Z2